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ABSTRACT

Critics argue against differentiated staffing on the bases that (1) limited compensation ranges lower teacher morale, (2) the loss of the services of trained teachers and the impersonality of the large group organization lower student incentive to achieve, and (3) salary savings are at the expense of the quality of the instructional program. Since most of the literature on the subject deals only in simple, logical theoretical discussion, this study attempted to answer critics through a practical implementation of the concept to ascertain if differentiated staffing could achieve school district dollar cost saving without a significant negative change in teacher morale and/or without a significant reduction in student achievement. Fifteen differentiated staff teams collaborated in one school district, and a group of traditional teachers functioned as the control unit. The dollar difference was computed to be less than 1 percent of the total cost; none of the schools reported a lower teacher morale during the first year of the team operation; and, in terms of cognitive growth, those students team taught remained at least on a par with their control groups. (Author/EA)

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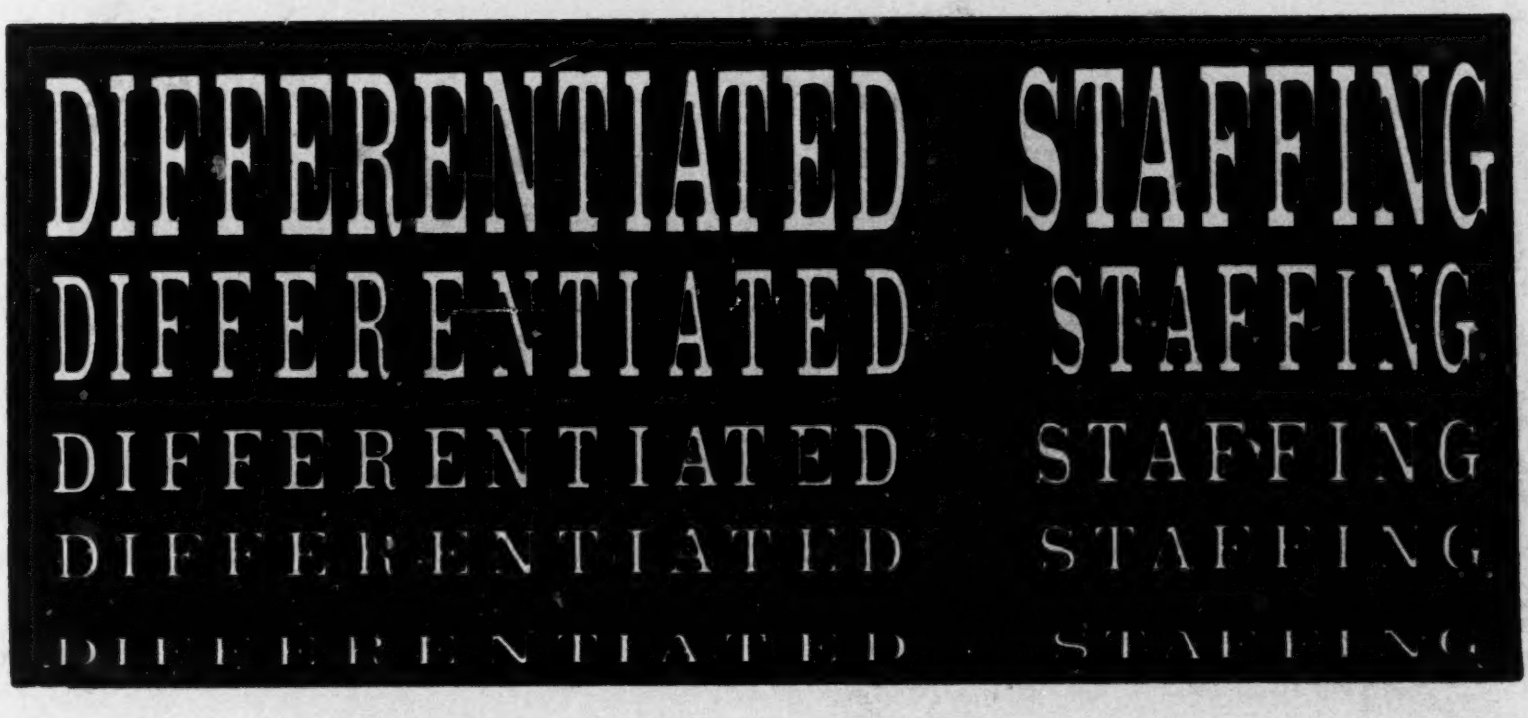

the analysis and evaluation of islands of differentiated staffing in

grand forks public schools
grand forks, north dakota.

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BUREAU OF EDUCATIONAL RESEARCH
UNIVERSITY OF NORTH DAKOTA

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AN ANALYSIS AND EVALUATION OF ISLANDS OF DIFFERENTIATED STAFFING

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DIFFERENTIATED STAFF

The concept of a differentiated staff for the public schools is predicated upon a major restructuring of the organizational base of attendance centers. Undoubtedly it is an outgrowth of other innovations which have had the effect of "opening" the classroom by inputing new instructional techniques, new ways of treating time, and new classes of educational personnel (i.e. teacher aides). Perhaps the ultimate educational innovation is to change the traditional method of organizing instructional personnel in relation to the group of students with whom they interact. The rationale for this innovative concept is based upon three logical considerations which are summarized in the following paragraphs.

If educational institutions establish an instructional hierarchy based upon teaching ability, the outstanding teachers would be recognized and the organizational patterns would provide a vehicle by which greater numbers of children would have exposure to excellent teaching. The conventional staffing arrangements (i.e. one teacher, thirty students) preclude such interaction and doom certain students to a form of educational inequality because of the variance in teacher quality which neither they, their parents, nor even the schools can control.

Clearly all teachers do not possess an equal teaching talent; yet the public schools have by and large created a reward system which has failed to recognize and provide for individual excellence among its ranks. Teachers have been considered as interchangeable parts, with advancement

and recognition based primarily on seniority and educational attainment. Promotions for outstanding upward mobile teachers have typically been out of the classroom and into administrative or supervisory positions. Thus, one could logically conclude that an inverse relationship exists between teaching expertise and exposure to students. Proponents of differentiated staffing claim that this innovation would halt the exodus of teaching talent by creating a hierarchical system which would reward the outstanding teacher both in terms of salary and professional stature.

Methods calculated to individualize instruction so that a student can progress at a pace consistent with his own interests and abilities have generally translated to mean more adults, although not necessarily more certified personnel, working with larger groups of students in new and often unique roles. Units of 150 to 180 students in contact with seven or eight adults have created a need for more precise planning and have allowed greater specialization of function on the part of the staff. To manage and plan educational experiences for these groups, a hierarchy of staff assignments based on differentiated responsibility is proposed. At the top of this hierarchy in terms of wages, responsibility, and status, are the master teachers who are chosen for their knowledge, ability and professional dedication. In addition to their teaching role, these outstanding educators may function as instructional diagnosticians, planners, interpreters of educational research, and perhaps as part-time teacher educators.

The staff teacher, who is at the next level in the differentiated staff, helps to plan the daily learning experiences, serves as both large and small group teacher, and implements curricular innovations. The

interns, who make up the third level of the hierarchical pyramid and might be classed as educational neophytes, work with small groups as well as individually with children, and in effect "learn the trade" of the teachers. Instructional aides carry out certain instructional tasks as well as support functions, thus relieving other members of routines which would diminish their value as teachers, and are the base of the instructional team.

In the differentiated staff, these specialized roles are combined to assist the student to be the master of his own educational behavior. Each child has the potential of receiving more adult interactions, while the threatening aspect of competing for attention with one teacher is absent. The teacher becomes in effect the educational guide rather than a dispenser of knowledge.

Expenditures for public education have been rising at an ever-accelerating rate during the past five years. Continued cost escalation may place local boards of education into a position where they will be unable to adequately finance their public schools. Proponents of a differentiated staff suggest that this concept has implications for reducing the angle of the expenditure curve while maintaining or even improving the quality of the educational experience.

This reduction in cost is to be accomplished by using a compensation plan based upon different salary ranges for different responsibilities. The master teacher would be paid substantially more than the typical maximum now paid to classroom teachers, while the interns and aides would have a salary range below the amount now paid to beginning teachers. Such a plan presupposes a fairly well defined job description based on a

hierarchy of responsibility as well as salary. Typically the staff unit would contain more personnel at the lower range than specialists at the upper salary levels. The total cost would be lower than in a conventional system where each teacher's salary would be more nearly equal.

The net result, according to the proponents, would be to increase the student-adult, although not necessarily the student-certified teacher, contacts per student hour. At the same time, the net cost per student would be less than under the conventional system. Since personnel costs are the largest single budget item in the public schools, (North Dakota 1969 average cost for instruction in high school districts was $397.27), use of a differentiated staff mode, it is predicted, would result in cost savings.

In summary, the differentiated staff has three major positive factors, according to those who advocate its adoption; first, it would give the excellent teacher the incentive to remain in the classroom, for he has the potential for greater compensation, as well as increased responsibility for the instructional program; second, it has the potential of greater individualization of instruction and more assistance from adults which will mean greater student achievement; and third, differentiated staff would result in net cost savings to the district because of more efficient ways of grouping students and large differentials in the compensation range among the instructional staff.

Skeptics use similar justifications as a rationale to attack the concept of differentiated staffing. They indicate that although the master teachers might have a better attitude toward teaching, the other

teachers would exhibit morale problems due to the limited compensation range and decision making capability into which their positions in the hierarchy would place them.

Students, they reiterate, would suffer because they would lose part of the services of qualified (in terms of training) teachers. The large group organization would tend to be impersonal, and the student would lose the incentive to achieve.

Salary savings either would not materialize, or if they did, they would be at the expense of the quality of the instructional program.

The concept of differentiating the staff has occasioned the writing of large numbers of articles and occasional papers in the various educational publications in the United States. A great majority of the articles are logical theoretical dissertations on the subject. This is because there have been few implementations of the concept, and accordingly little opportunity for either empirical or experimental findings. In a sense, there has been a great amount of smoke but little light from the fire kindled by the concept of a differentiated staff.

Most of the relatively few pioneer school districts who have actually implemented differentiated staffing have done so on a district-wide basis with heavy support either from USOE or private research foundations. In terms of evaluation, two control problems arise when this happens: 1) Obviously there is a district-wide Hawthorne effect which may mask certain disfunctions, and 2) There are no valid control groups to compare the relative merits of the two systems. In addition, the question of replication of such large scale projects in districts that will not be able to secure outside funding is suspect.

The Grand Forks project avoids the three problems cited above. By creating "Islands of Differentiated Staffing" rather than involving the entire district, there are effective controls for measurement. Since a smaller portion of the total resources of the district are committed to the project, the Hawthorne effect is not prevalent. Replication on a like scale by other districts who do not have sources of outside funding is within the realm of possibility.

THE GRAND FORKS MODEL

The professional personnel of the Grand Forks School District have engaged in team teaching efforts for several years. Therefore, implementation of differentiated staffing was a rather natural development. During the 1967-68 school year, several informal differentiated staffing teams operated. These experiences led to the establishment of two formal differentiated staffing teams for the school year 1968-69.

During the past (1969-70) school year, the Grand Forks School District employed fourteen differentiated staffing teams. The staffing configuration of these teams varied from three to eleven participants.

The Grand Forks School District established proportional staffing units (positions) to create instructional teams for specific situations. The contribution, job training requirements, staffing equivalency, instructional involvement, and compensations of each role is presented below:

POSITION	TRAINING	STAFF EQUIVALENCY[1]	INSTRUCTIONAL INVOLVEMENT	SCHOOL YEAR SALARY
Volunteer Aide	None	0	Limited under supervising certified teacher	
Clerical Aide	Typing ability (usually high school)	.43	Incidental under supervising certified teacher	$2,295.00
Instructional Aide	Some college training	.50	Normal activity as an implementor of individual prescriptions.	$2,430.00
Instructor	College trained certified teacher	.75	Normal activity as a full participant with certified staff. School day assignment only.	$5,000.00
Staff Teacher	B.S. (certified teacher)	1.00	Primary responsibility	Regular salary schedule
Team Teacher	B.S. (usually M.A.+) experienced professional leadership ability diagnostic and prescriptive teacher for individual differences	1.25	Primary responsibility coupled with a democratic staff leadership and "trouble shooter" activity	Regular salary schedule plus a basic payment of $500 and payment of $1 per hour per year per child instructed by the team.

[1]Staff equivalency is a term coined by Grand Forks School District personnel. It provides for a ratio between positions. A regular classroom teacher (staff teacher) is given a staff equivalency of 1.00. All other positions are computed on a ratio which relates to this value: team leader, 1.25; instructor, .75; instructional aide, .50; clerical aide, .43; and volunteer aide, 0.

Three of the fourteen differentiated teams utilized by the Grand Forks School District are described as follows:

TWINING SCHOOL	STAFF RATIO	ENROLLMENT
Team Leader	1.25	144
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Instructor	.75	
Instructional Aide	.50	
EIELSON SCHOOL		
Team Leader	1.25	210
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Instructor	.75	
Instructional Aide	.50	
Instructional Aide	.50	
Instructional Aide	.50	
Team Leader	1.25	220
Instructor	.75	
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Staff Teacher	1	
Instructional Aide	.50	
Instructional Aide	.50	
Clerical Aide	.43	

Some Islands were models of a hierarchical pattern, while others were composed of groups of teachers with no designated leader. All Islands contained instructional and/or para-instructional personnel below the staff teacher level.

The number of Islands created was a function of the amount of funds the district could release to provide certain extra instructional funds at $50.00 per student in each Island, plus funds to remodel the building areas

where the differentiated staffing was to be carried out. Islands were created in schools in which teachers and administrator interest was high and positive.

DATA ON REAL COST

Overview of the Evaluation Design

A major reason for the introduction of differentiated staffing into the Grand Forks School System was an attempt to reduce the cost curve without jeopardizing either teacher morale or student achievement. Thus the evaluation dealt with three major variables: direct instructional cost, teacher attitude, and student cognitive achievement. The design is a form of a cost effects model which purports to measure real costs in terms of the following statement: The Islands of differentiated staffing will have achieved a real cost saving to the district if there is a dollar cost saving achieved without a significant negative change in teacher morale and/or without a significant reduction in student achievement.

Dollar cost savings were measured by comparing the actual direct costs for operating the Islands against the projected per classroom costs for an equal number of children in a non-island (conventional) classroom. These figures were then compared to the projected operating costs for the Islands which were developed by the Grand Forks district administrators in May, 1969, before the Islands were in operation.

Teacher morale was assessed by three administrations of a standardized teacher attitude instrument, the Purdue Teacher Opinionaire: the first occurred in May, 1969; the second in September, 1969; and the final administration in March, 1970. The May administration was considered a

baseline from which to measure change; the September administration measured the teacher morale when school opened in the fall; and the March administration was, in effect, a posttest.

Student achievement was measured by two administrations of a standardized achievement test appropriate for the grade level: in grades K-2, the Stroud-Hieryonimous was used; in grades 3-8, the ITBS was used as the criterion measure; and in grades 9-11, appropriate subtests of the ITED were used.

Although the data are interrelated, they are presented in three separate sections of the evaluation. A final summary section is used to draw the parts together for a decision on the overall effect of the initial year of the Islands in terms of cost morale and student achievement.

Projected and Actual Direct Instructional Costs

Determination of the cost factors involved a comparison of projected figures for operation of each Island and its replaced classrooms, which were made by the school administration in Spring, 1969; then the actual instructional cost of operating an Island and the projected cost of educating a like number of students in a conventional classroom based on enrollments for the 1969-70 school year.

The first step in the comparisons was to determine the costs involved and to distribute them among the appropriate instructional units. The cost differentials between Islands and conventional classrooms included the following categories:

A) Salaries of the personnel involved

B) A fifty dollar per pupil instructional budget in excess of the

normal instructional supply allotment for each. The total per capita expenditure for each Island was portioned into capital equipment and supplies. A six year depreciation schedule was established for the items classified as equipment (classification based upon North Dakota School Finance Accounting Manual). Since this cost was a one year allotment and would not be repeated in other fiscal years, supplies were treated a bit differently than the Manual suggests. Close inspection of the supply items ordered for the Islands revealed that a substantial portion would not be expended in one year; therefore, a judgement was made by the researchers to use a two year depreciation schedule for all items listed in the Accounting Manual as instructional supplies. This is a deviation from the normal procedure for costing supply items, but it appeared justifiable on the basis of the evidence.

C) The remodeling costs assigned as a separate budget entry for the establishment of the Islands were depreciated on a ten year schedule.

D) The following formula was applied to develop the actual costs for each of the Islands: Actual Direct Cost of an Island Differentiated Staff = Salary Cost + 1/2 Student Additional Supply Cost + 1/6 of Cost of Equipment + 1/10 Cost of Remodeling. Projected costs which were to be used as comparison data were determined in the following manner:

1) The estimated cost per conventional classroom as determined by taking the projected fall enrollments in each Island and dividing them by a districtwide average classroom enrollment (i.e. all elementary classes were figured at 27 pupils per class), and multiplying that figure by the districtwide average teacher salary (i.e. $8,591.00).

2) Spring projected cost for differentiated staff Islands were

determined by computing the project salary costs (furnished by the administration) + 1/2 student cost for additional supplies + 1/6 cost of equipment + 1/10 remodeling cost.

Cost comparisons for the project year were based upon an estimate of the cost of educating the like number of children if they had not been in an Island, against the actual cost of educating that number of children in an Island. To arrive at the estimated cost for training the like number of students in a conventional classroom as were currently enrolled in an Island, the following formula was used:

$$\frac{\text{number of students enrolled in an Island}}{\text{average enrollment per grade districtwide}} \times \underset{\text{(average teacher salary)}}{\$8.591.00}$$

(The differences between the spring estimation and the fall projection were that the actual average number of students enrolled as determined by two monthly enrollment figures (November 30, 1969 and January 31, 1970) and the actual average per grade enrollment for the district, excluding the classrooms in the Islands, was substituted for the estimated average which was used in the spring).

Two monthly enrollments, November and January, were used because they represented the lowest (November) and the highest (January) enrollment figures. The fluctuation occurs because of large scale changes in Air Base personnel during the fall and winter.

Junior High and Senior High School Islands were calculated somewhat differently, since the students were in the Islands for only part of the day. The formula which estimated conventional classroom cost was determined in the following manner: The average enrollment per class period for all social science or English (these were the subjects taught in the

core Island classes) in the district was calculated. The average teacher salary was divided by five (the number of daily periods which a secondary teacher teaches) to arrive at the per period average. Core students were in an Island situation for two periods per day, thus the ratio was multiplied by two at Red River and Central. This was not done at Valley and South since each Island was one period in length per student. In addition to the salary costs, the actual figures for the Islands in the Junior and Senior High Schools included 1/2 the per student cost allowance for additional supplies plus 1/6 the additional equipment cost, plus 1/10 the cost of remodeling.

The purpose of the above calculation was to create comparable units and costs so that valid judgements could be made. The summary data derived from these formulae is presented in Table I.

It is evident that the spring estimated costs and the actual costs for the Islands of differentiated staff are extremely close, indicating careful planning on the part of the administration.

The spring estimated costs for conventional classrooms and the project year projected costs, however, vary considerably. This is due in large measure to a variance in the spring project enrollments and the actual enrollments in the fall. As a group, the largest difference between spring projections and fall enrollments was at the Junior High level. The greatest change in terms of money difference was in Colony C at Eielson.

Discussions and Conclusions

The initial fifty dollar per pupil additional instructional allotment, even when amortized over several years, was a causal agent for raising the

TABLE I

PROJECTED AND ACTUAL COST DATA FOR ISLANDS OF DIFFERENTIATED STAFF

SCHOOL	DIFF.ISLANDS	PROJ.ENROLL.	PROJ.COSTS BASED ON GFDS* MODEL		AVER.ENROLL.OF NOV.30, JAN.31	COSTS BASED ON PROJ.AND AVERAGE ENROLLMENT	
			PROJ.COST CONV.CLSRM	PROJ.COST DIFF.ISL.		PROJ.COST CONV.CLSRM	PROJ.COST DIFF.ISL.
Red River	Core	180 X 2 = 360	$20,085.76	$26,371.30	178.5 X 2 = 357	$20,274.76	$26,371.30
Central	Core	210 X 2 = 420	$24,621.81	$27,420.80	216 X 2 = 432	$27,491.20	$27,420.80
Lewis & Clark	K	33*	$10,309.20	$11,887.79	32*	$11,168.30	$11,958.96
Lewis & Clark	1-2	130	$41,236.80	$40,987.51	116	$36,082.20	$40,925.61
Eielson	Col.A (K-1)	60*	$19,072.02	$18,248.51	51*	$16,924.27	$18,239.92
Eielson	Col.B (1-2)	120	$38,144.04	$34,645.58	116	$36,339.93	$34,642.10
Eielson	Col.C (3-4)	220	$70,016.65	$47,109.40	219	$63,573.40	$47,109.28
Eielson	Col.D (5-6)	220	$70,016.65	$64,837.60	230	$65,291.60	$64,848.79
Twining	6	150	$47,765.96	$42,262.75	144	$39,518.60	$42,252.75
Valley	9 (Science)	360	$22,508.42	$30,360.20	333	$20,618.40	$30,360.20
Valley	7 (Soc.St.)	275	$18,178.56	$22,517.79	255	$16,838.36	$22,517.84
South	9 (Algebra)	150	$ 9,656.28	$ 9,729.40	141	$ 8,591.00	$ 9,729.81
South	7 (Lg.Arts)	312	$17,525.64	$17,845.71	292	$16,838.36	$17,845.86
TOTAL		2420	$409,137.79	$394,224.34	2323	$379,550.38	$394,223.22

1) *Grand Forks Differentiated Staffing Model

2) Kindergarten units adjusted to student units

Island costs above the projected conventional classroom costs. Since this fifty dollars is a single non-reoccurring type of expenditure, it might be classed as, in effect, a start-up cost for the project.

Undoubtedly there had to be certain inducements to encourage organizational change as well as to accomodate the need for different materials for a different style of teaching. Therefore, the idea of this amount being considered a start-up expense is justified. If one were to take twenty dollars ($20.00) per pupil (2,323), or a total of $46,460.00 away from the actual cost for the Islands ($394,223.22), it would reduce the cost well below the project cost under the conventional classroom structure.

Perhaps the major reason that the cost of the differentiated staff Islands exceeded the projected cost for the conventional classroom was the difference in the spring estimated enrollments and the actual average enrollments during the year. The estimate was some 97 students above the actual enrollment. This was due to a number of factors: first, the Air Base enrollments fluctuate considerably and it is difficult to accurately predict; and second, the use of a straight 27 to one ratio for all elementary classes was not an accurate method of prediction. Actually, the ratio varies from grade to grade; therefore, predictions should be made on a per grade average rather than on a districtwide single figure over all elementary grades. If the estimated cost saving by using the Islands over the conventional classrooms was considered to be fifteen thousand dollars ($15,000.00) on a four hundred nine thousand dollar ($409,000.00) operation, those who make building enrollment projections must take care to be extremely accurate.

One may argue that the method used to derive the projected cost for the conventional classroom was unduly severe, since it did not make allowance for the possibility of classrooms which might have deviated from the district average (i.e. an underfilled classroom of, for example, twenty children, would raise the cost of that particular grade). However, when one measures an experimental group against a control group, he must exercise stringent regulations so that the decision is, in effect, on the conservative side. Thus, the experimental group is judged according to the most conservative estimates so the finding may not be challenged at a later time.

Based on the calculations cited in this section, the actual cost for the initial year of the Islands of differentiated staffing appear to be higher than a like number of children taught under a conventional classroom setting. The difference is less than one-half of one per cent of the total and cannot be considered a statistically significant difference.

TEACHER MORALE

The second facet of the evaluation design was that the introduction of the Islands of differentiated staffing would not cause a significant erosion of teacher morale in the schools where the Islands were located. Morale is not an easy concept to measure since it is obviously comprised of a variety of personal, organizational, and even community variables. Nevertheless no evaluation of a differentiated staff would be complete without this component.

The following design attempts to accomplish this measurement.

Population and Sample

The population was the instructional staffs of the seven schools which housed Islands during the 1969-70 school year. The sample size of 25 from each building was chosen by random selection with the following exceptions: A) All members of the staff of the Island in a given building were included in the sample of 25; B) At Lewis and Clark, the total staff (13 teachers) was sampled; and C) The entire teacher population at the Eielson School was included (as all the teachers in this school are in Islands.

Instrumentation

The Purdue Teacher Opinionaire, which was chosen as the appropriate instrument to measure morale, is multidimensional. Ten factors which have been identified with high and low morale are measured and scaled.

In addition, it is scaled so that a total score may be used as an overall indicator of staff morale.

Validation procedures included testing of several criterion groups (a total of 3,023 teachers) by peer judgements into classification of "high," "middle," and "low" morale teachers. When the instrument was administered to these teachers, the factors correlated highly (beyond the critical value at the .05 level) with the peer judgements. The authors also employed a principle components analysis with an oblique biquartimin rotation to test for construct validity.

A test-retest procedure produced a realiability co-efficient of .87. Thus the instrument seemed to meet the requirements for validity and reliability, and was considered adequate for the measurement.

Treatment

The Purdue was administered to the teachers in the sample three times. The first administration was in late May, 1969. At that time the teachers did not know where the Islands of differentiated staffing would be located. This administration established a baseline for the administrations which were subsequently made.

The fall administration was made during the first week of the semester, while the final administration occurred during the first week in March, 1970.

The factor scores as well as the totals were placed on IBM punched cards, and a One Way Analysis of Variance was used to compare total score treatments of the seven schools. In addition to the total score

comparisons, five selected factor scores labeled: Satisfaction with teacher; Rapport among teachers; Teacher load; Curricular issues; and Teacher status, were tested.

Presentation of the Data

The data are arranged in a series of tables. Table I summarized the three administrations (June, 1969; September 1969; and March, 1970) by the total score which is a summation of the ten factor scores.

TABLE I

MEAN TOTAL SCORE AND .05 LEVEL OF SIGNIFICANCE ON THE F TEST FOR EACH OF THE THREE ADMINISTRATIONS

SCHOOL	MAY,1969	SEPT.,1969	MARCH,1970	F SCORE	.05 LEVEL
Lewis & Clark	327.7	333.7	328.2	.294	N.S.
Twining	321.5	335.0	327.0	.819	N.S.
Eielson	331.6	346.4	339.4	2.47	N.S.
Red River	295.6	314.2	311.5	1.96	N.S.
Central	321.6	330.3	325.1	.385	N.S.
Valley	334.7	331.1	325.1	.446	N.S.
South	328.5	345.9	345.6	2.35	N.S.

There was no school in which the morale, judged as a total score on ten factors, varied significantly over the three administrations. Thus, it appears that morale among the teachers in the sample did not drop as a result of the introduction of Islands of differentiated staffing in their school. The maximum score possible on the Purdue was 400 (a table which converts raw scores into stanines may be found at the end of this

section).

Ten factors were involved in the calculations in Table I. The next series of tables take individual factor scores which would appear to be most closely associated with the issue of differentiated staffing and compare them over the three administrations of the Purdue. This was done to allay the possibility that significant differences on particular factors had been masked by being included in a total score.

Table II reports the data based on the factor entitled "Satisfaction with teaching."

TABLE II

MEAN SCORE AND .05 LEVEL OF SIGNIFICANCE ON THE F TEST ON THE FACTOR "SATISFACTION WITH TEACHING" FOR THE THREE ADMINISTRATIONS

SCHOOL	MAY, 1969	SEPT.,1969	MARCH,1970	F SCORE	.05 LEVEL
Lewis & Clark	68.64	69.85	69.53	.088	N.S.
Twining	70.75	68.54	68.53	.6888	N.S.
Eielson	72.58	71.13	69.91	1.66	N.S.
Red River	66.89	67.70	68.45	.17	N.S.
Central	70.09	69.8	68.75	.308	N.S.
Valley	70.03	69.25	67.09	.961	N.S.
South	66.25	70.05	69.78	1.24	N.S.

Table II shows no significant changes between the three administrations. Satisfaction with teaching among the groups did not change with the addition of Islands of differentiated staff.

Table III presents the data on the factor entitled "Rapport with teachers."

TABLE III

MEAN SCORE AND .05 LEVEL OF SIGNIFICANCE ON THE F TEST ON THE FACTOR "RAPPORT WITH TEACHERS" FOR THE THREE ADMINISTRATIONS

SCHOOL	MAY,1969	SEPT.,1969	MARCH,1969	F SCORE	.05 LEVEL
Lewis & Clark	47.64	48.71	47.00	.200	N.S.
Twining	45.58	49.00	46.58	1.93	N.S.
Eielson	74.64	50.94	49.65	3.58	Sign.
Red River	43.19	43.95	42.86	.154	N.S.
Central	46.34	46.73	47.45	.229	N.S.
Valley	48.55	47.31	44.95	2.03	N.S.
South	47.67	49.11	48.71	.632	N.S.

Eielson was the only school which exhibited a significant change at the .05 level on the factor "Rapport with Teachers." Inspection of the mean scores shows that the greatest contributor to the variance from a grand mean of 49.51 was the May, 1969 administration. That administration was given before the project began; therefore, it would appear that rapport was better in the 1969-70 school year than it was in the late May, 1969.

Table IV summarizes the date on the factor "Teacher load."

TABLE IV

MEAN SCORE AND .05 LEVEL OF SIGNIFICANCE ON THE F TEST ON THE FACTOR "TEACHER LOAD" FOR THE THREE ADMINISTRATIONS

SCHOOL	MAY,1969	SEPT.,1969	MARCH,1970	F SCORE	.05 LEVEL
Lewis & Clark	34.50	33.64	32.07	.610	N.S.
Twining	34.45	34.54	35.37	.183	N.S.
Eielson	37.03	37.51	37.08	.178	N.S.
Red River	28.44	32.54	31.18	1.73	N.S.
Central	36.29	35.21	35.33	.409	N.S.
Valley	36.62	37.25	37.38	.192	N.S.
South	36.36	37.44	38.00	.706	N.S.

Differentiating the staff for a portion of the teachers in each building did not appear to have a significant effect on perception of the equity of the teacher load in the seven schools.

Table V reports the data on the factor labeled "Curriculum issues."

TABLE V

MEAN SCORE AND .05 LEVEL OF SIGNIFICANCE ON THE F TEST ON THE FACTOR "CURRICULUM ISSUES" FOR THE THREE ADMINISTRATIONS

SCHOOL	MAY,1969	SEPT.,1969	MARCH,1970	F SCORE	.05 LEVEL
Lewis & Clark	16.42	16.85	16.30	.222	N.S.
Twining	15.95	16.62	16.25	.397	N.S.
Eielson	15.67	18.18	17.74	12.4	Sign.
Red River	14.54	16.16	15.90	2.17	N.S.
Central	16.39	16.56	16.54	.022	N.S.
Valley	15.93	16.31	16.19	.127	N.S.
South	15.82	16.72	17.17	2.16	N.S.

Eielson was the only school in which there was a significant change in morale based on the factor "Curriculum issues." Both administrations in the 1969-70 school year reported mean scores above the grand mean; therefore, one can conclude that teachers had higher morale in terms of curriculum issues during 1969-70 than in the spring of 1969.

The factors labeled "Teacher status" may not be directly correlated with differentiated staffing; however there is undoubtedly some tangible effect on teacher morale. Thus, Table VI, which reports mean data and significance on the factor "Teacher status," has been included.

TABLE VI

MEAN SCORE AND .05 LEVEL OF SIGNIFICANCE ON THE F TEST ON THE FACTOR "TEACHER STATUS" FOR THE THREE ADMINISTRATIONS

SCHOOL	MAY, 1969	SEPT.,1969	MARCH,1970	F SCORE	.05 LEVEL
Lewis & Clark	23.92	26.07	24.07	1.08	N.S.
Twining	25.83	25.58	24.83	.372	N.S.
Eielson	25.67	27.62	27.39	2.71	N.S.
Red River	19.79	23.75	23.04	4.86	Sign.
Central	23.04	24.56	24.50	.659	N.S.
Valley	24.65	24.63	24.80	.010	N.S.
South	25.25	26.16	26.00	.291	N.S.

Red River was the only school which had a change on this dimension which was significant at the .05 level. The mean score indicated that morale among the teachers as measured by the factor "Teacher status" was

higher in 1969-70 than in the spring of 1969.

Summary and Conclusions

The purpose of this section was to determine whether there was a negative change in teacher morale in the buildings where Islands of differentiated staffing were operating. A standardized instrument, the Purdue Teacher Opinionaire, was used to measure morale. Three administrations, May, 1969; September, 1969; and March, 1970, were carried out on samples of the population of teachers in each building.

Comparisons on the total score for the Opinionaire indicated no significant decrease in morale in any of the buildings where the Islands were located. Factor scores on specific sub-scales which could logically be identified with morale which could be affected by use of the Islands were also tested. Of a possible 36 F tests, only three reported significant difference at the .05 level. Inspection of each of the significant scores revealed a higher mean score (thus higher morale) in the 1969-70 administrations than on the spring, 1969 administration.

The major conclusion of this section is that there appears to be no measurable erosion of teacher morale as a result of the implementation of the Islands of differentiated staffing in the Grand Forks Public Schools.

TABLE VII

RAW*-TO-STANINE SCORE CONVERSION TABLE OF ELEMENTARY SCHOOL TEACHERS FOR THE PURDUE TEACHER OPINIONAIRE

STANINES	FACTORS 1	2	3	4	5	6	7	8	9	10	TOTAL	STANINES
9	80	80	56	28	44	20	32	20	20	20	377-400	9
8	79	78-79	55	27	42-43	19	30-31	19	19	19	366-376	8
7	77-78	76-77	53-54	25-26	41	18	28-29	18	18	18	353-365	7
6	74-76	74-75	51-52	22-24	38-40	17	26-27	16-17	16-17	17	337-352	6
5	67-73	70-73	48-50	20-21	35-37	15-16	23-25	14-15	15	16	319-336	5
4	60-66	65-69	44-47	17-19	32-34	13-14	21-22	12-13	13-14	15	297-318	4
3	49-59	59-64	40-43	15-16	29-31	11-12	18-20	10-11	10-12	14	276-296	3
2	36-48	52-58	34-39	11-14	24-28	9-10	15-17	8-9	8-9	12-13	249-275	2
1	20-35	20-51	14-33	7-10	11-23	5-8	8-14	5-7	5-7	5-11	100-248	1

*Raw scores shown in this table are based upon the responses of 1,464 elementary school teachers from fourteen states.

STUDENT ACHIEVEMENT DATA

The third major variable related to testing the differentiated staffing concept was the facet of student achievement. The research design was structured to determine whether student achievement in the islands was significantly different than student growth among children in conventional classrooms. Thus, if a differentiated staffing arrangement does not result in an inferior educational project, then it is certainly worth further consideration as an organizational system. An important test of the differentiated staffing concept thus falls on testing student achievement.

Population and Sample

The experimental population consisted of those students who were being instructed in the Islands of differentiated staff during 1969-70, plus a control group of a similar size taught in conventional classrooms. The sample excluded kindergarten and first grade students. Testing was conducted in eight grade levels: two through seven, nine, and eleven. A total of 1897 students participated in both the pre and post tests. The distribution is shown in Table I.

Instrumentation and Statistical Treatment

The tests developed at the State University of Iowa (Primary Reading Profile, the Iowa Test of Basic Skills, and the Iowa Test of Educational Development) and published by Houghton-Mifflin Publishing Company were used as a criterion measurement in the present study. The Primary

TABLE I

OVERVIEW OF THE EXPERIMENTAL AND CONTROL GROUPS

GRADE	EXPERIMENTAL GROUP	CONTROL GROUP	TEST USED
2	Lewis & Clark Eielson (n=27)	Viking Twining (n=102)	Primary Reading Profile
3	Eielson (n=57)	Twining (n=87)	ITBS V, R, Arith. Prob.
4	Eielson (n=56)	Twining (n=112)	ITBS V, R, Arith. Prob.
5	Eielson (n=80)	Twining (n=102)	ITBS V, R, Arith. Prob.
6	Eielson Twining (n=188)	Viking (n=83)	ITBS V, R, Arith. Prob.
7	South (n=254)	Valley (n=249)	ITBS V, R
7	Valley (n=249)	South (n=254)	ITBS WSS
9	South (n=113)	South Valley (n=299)	ITED Quant. Thinking
11	Central (n=33) Red River (n=41)		ITED Social Studies

Reading Profile was used at the second grade level; the Iowa Test of Basic Skills was used in grades three through seven; and the Iowa Test of Educational Development was used in grades nine and eleven. The statistical analysis used was the analysis of variance (on post test data) and the analysis of covariance. At each grade level, a control group was defined to be as nearly comparable to the experimental group as was feasible. The exception to this procedure was in grade eleven, where no control group could feasibly be defined. For this level, a related 't' test was used. In

every case, the pre test was the testing done in the usual September testing program. A special post testing was arranged for late March and early April.

Presentation of the Data

The data are presented by grade level. The pre and post means and F ratios and the adjusted (covaried) F values are reported.

Second Grade

In the second grade, the differentiated staffing approach was used in Lewis and Clark School and Eielson School (Grand Forks Air Base). Pre and post data on the Primary Reading Profile (Stroud-Hiero ymous) was available for 27 students. For a control group, second graders at Twining School (Grand Forks Air Base) and Viking School were used (n=102). The criterion scores are recorded in raw score units. The data are presented in Table II.

Only one of the tests shows significance at the second grade level, on the Reading Comprehension subtest. When the analysis of covariance was used, the difference became non-significant.

Third Grade

To test the effectiveness of the third grade model, the Iowa Test of Basic Skills (ITBS) was used as a criterion. Three subtests were used: vocabulary, reading comprehension, and arithmetic problem solving. Both the control and experimental groups were at the Grand Forks Air Base. The third grade students who were available for pre and post testing at Eielson School (n=57) served as the experimental group, and the third grade students

TABLE II

MEANS AND F RATIOS FOR SELECTED PORTIONS OF THE PRIMARY READING PROFILE, GRADE TWO

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Test: Aptitude for Reading					
Experimental	20.93	24.30	2.73	24.10	3.24
Contro	20.54	22.46		22.51	
Test: Word Recognition					
Experimental	46.07	48.40	2.41	47.20	.03
Control	42.18	46.72		47.04	
Test: Word Attack					
Experimental	16.04	16.85	.03	16.30	.32
Control	14.34	16.67		16.82	
Test: Reading Comprehension					
Experimental	36.70	44.70	5.31*	43.53	3.61
Control	33.30	39.50		39.81	

*Significant at the .05 level

at Twining School (n=87) who were available for both pre and post testing served as the control group. The criterion scores were recorded as grade-equivalents, and are reported in Table III.

For the third grade model, no differences were found on the Vocabulary and Reading Comprehension subtests. However, the control group exceeded the differentiated staff model on the Arithmetic Problem Solving subtest.

Fourth Grade

The fourth grade achievement testing was quite similar to the third grade model. The same schools and subtests were involved. Again, Eielson

TABLE III

MEANS AND F RATIOS FOR SELECTED PORTIONS OF THE ITBS, THIRD GRADE

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Test: ITBS Vocabulary					
Experimental	3.22	4.01	.21	4.02	.34
Control	3.24	4.08		4.08	
Test: ITBS Reading Comprehension					
Experimental	3.29	4.29	1.08	4.27	2.75
Control	3.23	4.48		4.49	
Test: ITBS Arithmetic Problem Solving					
Experimental	3.01	3.73	7.95*	3.72	14.37*
Control	3.01	4.16		4.16	

*Significant at the .01 level

School served as the experimental group (n=56) and Twining School served as the control group (n=112) Results of the comparisons are shown in Table IV.

TABLE IV

MEANS AND F RATIOS FOR SELECTED PORTIONS OF THE ITBS, FOURTH GRADE

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Test: ITBS Vocabulary					
Experimental	4.21	4.92	.00	4.94	.01
Control	4.24	4.93		4.92	
Test: ITBS Reading Comprehension					
Experimental	4.32	4.71	.49	4.66	2.21
Control	4.22	4.86		4.88	
Test: ITBS Arithmetic Problem Solving					
Experimental	3.73	4.50	.33	4.50	.46
Control	3.73	4.60		4.61	

No significant difference was found on the fourth grade level.

Fifth Grade

The fifth grade model is essentially the same as the third and fourth grades. Again, Eielson School served as the experimental group (n=80) and Twining School served as the control group (n=102). The subtests of the ITBS used were the Vocabulary, Reading Comprehension, and Arithmetic Problem Solving. Criterion scores are recorded as grade-equivalents. The results are summarized in Table V.

TABLE V

MEANS AND F RATIOS FOR SELECTED PORTIONS OF THE ITBS, FIFTH GRADE

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Test: ITBS Vocabulary					
Experimental	5.31	6.32	2.93	6.22	2.40
Group	5.10	5.99		6.06	
Test: ITBS Reading Comprehension					
Experimental	5.30	6.06	.00	6.08	.06
Control	5.33	6.06		6.05	
Test: ITBS Arithmetic Problem Solving					
Experimental	4.86	5.74	.27	5.67	.08
Control	4.65	5.65		5.71	

The post test and adjusted post test scores for the two groups showed only a small variation; consequently there was no significant difference.

Sixth Grade

In the sixth grade, the experimental groups were all the students

at both Air Base Schools (Eielson and Twining) who took both the pre and post tests (n=188) The control group was the sixth grade students at Viking School (n=83). Again, the criterion tests used were the three subtests of the ITBS (Vocabulary, Reading Comprehension, and Arithmetic Problem Solving). The criterion scores were recorded as grade-equivalents and are presented in Table VI.

TABLE VI

MEANS AND F RATIOS FOR SELECTED PORTIONS OF THE ITBS, SIXTH GRADE

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Test: ITBS Vocabulary					
Experimental	6.62	7.34	.97	7.30	.09
Control	6.43	7.18		7.27	
Test: ITBS Reading Comprehension					
Experimental	6.57	7.11	1.89	7.09	2.51
Control	6.48	6.85		6.89	
Test: ITBS Arithmetic Problem Solving					
Experimental	5.62	6.73	5.05*	6.75	11.92**
Control	5.76	6.33		6.26	

*Significant at the .05 level
**Significant at the .01 level

The only significant difference in the sixth grade occurred in the subtest on Arithmetic Problem Solving, where the differentiated staffing model exceeded the control group on both the post test scores and the adjusted post test scores.

Seventh Grade

South Junior High School and Valley Junior High School served both

as the control group and experimental group in the seventh grade. This was because both groups were in a differentiated staffing arrangement for at least part of the day. At Valley School, the differentiated staffing was in the social studies area; Thus, for the social studies sections (the work study skills areas of the ITBS), South School served as the control group. At South School, the differentiated staffing occurred in the language arts; thus, Valley School was considered the control group when the criterion was the vocabulary and reading portions of the ITBS. The criterion scores are recorded as grade-equivalents, and are reported in Table VII.

Interpreting the data in Table VII would require a statement of mixed results. Not considering the covariance results, there were no significant differences between the experimental (differentiated staffing) group and the control group. Using the covariance, two significant differences were found; one favoring differentiated staffing (ITBS - Map Reading), and one favoring the control group (ITBS Vocabulary).

Ninth Grade

Testing in the ninth grade was concerned with those students who received their instruction in Algebra in the differentiated staffing mode, and a control group. The experimental group (n=113) included those students at South School who had been in the differentiated staffing Island. The control group (n=299) were those students at South School who were instructed in the usual mode of presentation, and also those students at Valley School. Data is included only for those students who were involved in both the pre and post testing. The criterion measure

TABLE VII

MEANS AND F RATIOS FOR SELECTED PORTIONS OF THE ITBS, SEVENTH GRADE

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Test: ITBS Vocabulary					
Experimental	7.54	7.64	2.82	7.65	9.94*
Control	7.51	7.87			
Test: ITBS Reading Comprehension					
Experimental	7.48	7.68	1.97	7.69	1.76
Control	7.65	7.88		7.87	
Test: ITBS Work Study Skills - Map Reading					
Experimental	7.41	8.57	3.28	8.64	16.46*
Control	7.61	8.30		8.23	
Test: ITBS Work Study Skills - Reading Graphs and Tables					
Experimental	7.59	8.42	.51	8.37	1.08
Control	7.37	8.68		8.73	
Test: ITBS Work Study Skills - Knowledge and Use of Reference Materials					
Experimental	7.59	8.36	.34	8.37	.97
Control	7.59	8.28		8.28	
Test: ITBS Work Study Skills - TOTAL					
Experimental	7.53	8.45	.95	8.45	3.40
Control	7.53	8.32		8.32	

*Significant at the .01 level

used was the Iowa Test of Educational Development (ITED) subtest in Quantitative Thinking. The scores were recorded in standard score units. The results are reported in Table VIII.

From Table VIII, it can be seen that the group taught in the differentiated staffing mode scored significantly higher on both the post test

TABLE VIII

MEANS AND F RATIOS FOR THE ITED QUANTITATIVE THINKING, NINTH GRADE

GROUP	PRE-TEST MEAN	POST-TEST MEAN	F RATIO	ADJUSTED POST-TEST MEAN	F RATIO
Experimental	13.80	19.92	23.60*	19.70	36.72*
Control	13.34	17.14		17.23	

*Significant at the .01 level

means and on the adjusted post test means (adjusted using the analysis of covariance procedure) on the ITED Quantitative Thinking criterion. Thus, the growth showed more than two standard score units, even when adjusted on the pre test measure.

Core Classes

At both high Schools, Central and Red River, a "core" was used. The model varied dramatically from those previously considered. Perhaps the largest single difference lies with the fact that the students in the core program were those who mgiht be termed pre-dropout. In terms of the total spectrum of educational achievement, these students would rank at the lower end of the continuum. A difference exists also in the experimental design; because there is only one identifiable core group within each high school, no control group was used. The criterion used was the Reading Social Studies Test at both Red River (n=33) and at Central (n=41). The test is a subtest of the ITED.

In both cases, a related 't' test was completed. The scores are recorded in standard score units. All students were high school juniors. The results are found in Tables IX and X.

TABLE IX

PRE AND POST TEST MEANS ON READING SOCIAL STUDIES SUBTEST OF ITED (n=33)

PRE-TEST MEAN	POST-TEST MEAN	't'
13.06	12.03	1.07*

*Significant at the .05 level

TABLE X

PRE AND POST TEST MEANS ON READING SOCIAL STUDIES SUBTEST OF ITED (n=41)

PRE-TEST MEAN	POST-TEST MEAN	't'
13.00	12.1	.91

From the point of view of the present innovation, the core model gives some indication of a drop in achievement, one of the drops being significant. Apparently some other method might be more effective with core type students.

Overall, the material relating to the core programs at Central and Red River High Schools should be interpreted with caution. There is a high degree of a probability of an inappropriatness of the testing program at that level. This is generally due to the fact that the testing in the core program was not criterion testing; that is, it did not test concerning the objectives of the core program. In that the core program was concerned with the potential dropout, the concerns of the faculties in these programs were not so much oriented toward achieving well on traditional paper and pencil achievement tests, but on a change of attitude in the student. Obviously, the concern was first with insuring that the student remain in school and feel at least some success in his remaining in school. Also, rather than a collegiate orientation, there would be a

much higher tendency toward a vocational orientation in the core student. No testing is reported concerning these goals of the core program; any future research efforts with the core students should follow more closely the objectives of the core program than be oriented toward traditional testing.

Summary

In the elementary schools, very little difference can be found between the differentiated staffing models and the traditional situation. The evidence in the ninth grade seems to favor the differentiated staffing approach, at least in terms of the criterion of Quantitative Thinking. A rather strong note of caution in terms of achievement has to be sounded in the core model. Both groups have actually dropped in achievement, and one of these drops is significant. Because the core model is quite different than the other models discussed in that the core is dealing with potential dropouts, the differentiated staffing approach does not seem to be the answer. It is not the first innovation to run into trouble with the core type student.

SUMMARY AND CONCLUSIONS

Each section of the study has a summary which characterizes its findings. Consequently, the general summary will speak to the interactive design which is described on page 9. The Islands of Differentiated Staffing will have achieved a real cost saving to the district if there is a dollar savings achieved without a significant negative change in teacher morale and/or without a significant drop in student achievement.

The dollar savings were determined by comparing actual direct costs for operating an Island against the projected per classroom costs for an equal number of children in a non-island (conventional) classroom. Teacher morale was assessed by repeated measures of the Purdue Teacher Opinionaire.

To measure negative change in student achievement, two administrations of a standardized achievement test were made to both the students in the Islands and a control group of a similar size.

Table presents the three variables: cost, morale, and achievement, for each model. Data on morale and achievement are reported in terms of significant change, whether negative or positive.

Several Islands failed to exhibit the expected lower cost figure during the initial year of operation in a differentiated staff mode. This appears to be due to some slight miscalculations in projecting enrollments. However, the dollar difference is extremely small, less than one per cent, of the total cost. If the pro-rated fifty dollar per

TABLE I

COMPARISON OF THE COSTS, EFFECTS ON TEACHER MORALE, AND STUDENT ACHIEVEMENT FOR EACH ISLAND, AND SUMMARY OF EACH MEASURE FOR THE TOTAL PROJECT

SCHOOL	GRADE	COST			MORALE	STUDENT ACHIEVEMENT SIGN. DIFFERENCES
		ISLAND	CONVENTIONAL	SAVING		
Lewis & Clark	K	$11,958	$11,168	No	Not sign.	No data
Lewis & Clark	1-2	40,925	36,082	No	Not sign.	Not sign.
Eielson	K-1	18,239	16,924	No	Not sign.	Not sign.
Eielson	1-2	34,624	36,339	Yes	Not sign.	Not sign.
Eielson	3-4	47,109	63,573	Yes	Not sign.	Gr. 3 Ex. sign. lower than C one sub-test out of three
Eielson	5-6	64,848	65,291	Yes	Not sign.	Gr. 6 Ex. sign. higher than C
Twining	6	42,252	39,518	No	Not sign.	Ex. sign. higher than C
Valley	9	30,360	20,618	No	Not sign.	Not sign.
Valley	7	22,517	16,618	No	Not sign.	Ex. sign. higher than C
South	9	9,729	8,591	No	Not sign.	Ex. sign. higher than C
South	7	17,845	16,838	No	Not sign.	Ex. sign. higher than C
Red River	Core	26,371	20,274	No	Not sign.	Not sign.
Central	Core	27,420	27,491	Yes	Not sign.	Not sign.
TOTAL		$394,223	$379,550	9- No 4-Yes	No sign. neg. change in any island	In 11 islands, the Ex. group was either not sign. diff. or reported mean scores sign. higher than corres. Control group

student excess material and equipment cost were not calculated into the formula, the direct cost would be significantly less than the conventional system. As this cost is amortized, the Islands may begin to demonstrate a positive cost differential.

None of the schools reported a lower teacher morale during the first year of the operation of the Islands. Apparently the faculty in those schools, whether or not they were members of a differentiated staff, did not feel threatened by the fact that this organizational pattern was being used in their building.

The Islands remained at least on a par with their control groups in terms of cognitive growth, as measured by the tests reported in the previous section.

Based upon the evaluation method described, the Islands did not achieve reduction in dollar cost to the district as had been expected. Perhaps the other findings, that teacher morale was not negatively affected, and that student achievement of the experimental groups was not lower than that of the control groups, are in some ways more significant to practicing administrators. Obviously it is easier to correct errors in projecting enrollments (which was the major reason that dollar costs did not decrease) than to effect change in either teacher morale or student achievement.